

REMARKS

The claims have been amended to more clearly define the invention as disclosed in the written description. In particular, claims 26-29 have been cancelled. In addition, the claims have been amended for clarity.

With regard to claims 1-27, the Examiner states "Claims 1-27 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Claims are directed to a method and apparatus that fail to produce a tangible result. A musical key is determined, notes are identified, etc., but no tangible result is produced."

It appears that the Examiner is focusing on the first two sentences of MPEP § 2106(II)(A), which states "The claimed invention as a whole must accomplish a practical application. That is, it must produce a "useful, concrete and tangible result." *State Street*, 149 F.3d at 1373, 47 USPQ2d at 1601-02." However, Applicants suggest that the Examiner continue his study, at least through the next two columns of the MPEP. In particular, several examples are given in which the court (CAFC) indicated that the claimed inventions have a practical application because they produce useful, concrete, and tangible results, for example:

"Claims drawn to a long-distance telephone billing process containing mathematical algorithms were held to be directed to patentable subject matter because "the claimed process applies the Boolean principle to produce a useful, concrete, tangible result without pre-empting other uses of the mathematical principle." *AT&T Corp. v. Excel Communications, Inc.*, 172 F.3d 1352, 1358, 50 USPQ2d 1447, 1452 (Fed. Cir. 1999);

"[T]ransformation of data, representing discrete dollar amounts, by a machine through a series of mathematical calculations into a final share price, constitutes a practical application of a mathematical algorithm, formula, or calculation, because it produces 'a useful, concrete and tangible result' -- a final share price momentarily fixed for recording and reporting purposes and even accepted and relied upon by regulatory authorities and in subsequent trades." *State Street*, 149 F.3d at 1373, 47 USPQ2d at 1601".

The present invention is no different from these two examples, in that a signal containing music is parsed and analyzed so as to determine the musical key of the music contained in the signal.

The musical key of an audio signal is indeed tangible. For example, a musician (or automatic accompaniment) would use such in order to provide musical accompaniment to a vocal artist or instrumentalist. The musician (or automatic accompaniment) using the apparatus as claimed in, for example, claim 15, would then be able to determine the musical key in which the vocal artist is singing (or the instrumentalist is playing) and the musician (or automatic accompaniment) would be able to provide the musical accompaniment.

Furthermore, U.S. Patents 5,424,486 and 6,057,502 cited and used by the Examiner in rejecting the claims, describe similar apparatus in which the object is to determine the musical key (or musical chords) of a music piece. Surely, the Examiner is not indicating that these patents as well as the above-cited cases, all present non-statutory subject matter as not producing tangible results.

The Examiner has rejected claims 1-26, 28 and 29 under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 5,424,486 to Aoki in view of U.S. Patent 6,057,502 to Fujishima.

The Aoki patent discloses musical key determination on the basis of both chord and melody (col. 1, lines 60, 61). A single possible key is nominated on the basis of whether or not a dominant motion is present in a chord progression. When it has been confirmed that the nominated possible key is also not inconsistent with the melody, the possible key is made confirmed key (col. 3, lines 11-15). The dominant motion means a chord progression from the dominant seventh chord to the tonic chord (col. 3, 43-45). Key determination is carried out by detecting a dominant section in connection with the chord progression and by examining the scale notes of provisional new key and last key in connection with the melody (col. 4, lines 62-67).

The Fujishima patent discloses an apparatus and method for recognizing musical chords, in which a time fraction of a musical soundwave is first analyzed into frequency components in the form of a frequency spectrum having a number of peak energy levels; a predetermined frequency range of the spectrum is cut out for the analysis of chord recognition; the cut-out frequency spectrum is then folded on an octave span; the frequency axis is adjusted by an amount of difference between the peak frequency positions of the analyzed spectrum and the corresponding frequency positions of the processing system; and then a chord is determined from the locations of those peaks in the established octave spectrum by

pattern comparison with the reference frequency component patterns of the respective cord types.(col. 2, lines 42-56).

The subject invention relates determining the musical key of an audio signal and includes analyzing a signal portion of the audio signal to identify a musical note (page 6, line 1); preferably, the key is determined using identified bass musical notes (page 6, line 2); where at least one musical note has been identified for the portion, the method then determines a strength associated with the musical note or notes. The strength is determined as a function of the amplitude of one or more frequency components of the identified musical note (page 6, lines 8-12). Once the strength associated with each musical note within a portion has been determined, a data record is generated comprising the identity of the musical note or notes, the strength associated with each note and the identity of the portion (page 6, lines 12-15). This is done for several portions of the audio signal, resulting in a set of data records (page 6, lines 15-20). Within each record, any strength associated with a musical note less than a predetermined fraction of the maximum strength associated with any identified musical note contained in any record with the set of data records is deleted from the data records (page 6, lines 20-25). A first note is determined from the identified musical notes as a function from their respective strength (page 6, lines 27, 28). At least a second and a third note are selected as a function of the first note (page 6, lines 28, 29). Depending on the musical scale, the first note would represent the tonic of the scale and

the second and third notes could represent alternative interval notes corresponding to the major and minor modes of the key (page 6, line 30 - page 7 line 2). Finally, the key is determined based on a comparison of the respective strengths of at least the second and third notes (page 7, lines 3-5, or page 13 lines 10-12).

It is the Examiner's position that Fujishima discloses all of the steps indicated in claim 1 in order to establish a chord, while Aoki may use this determined chord to determine the musical key.

Applicants do not see how the combination of Aoki and Fujishima leads to the claim 1 limitation "determining the key based on a comparison of the respective strengths of the at least second and third notes". Rather, Applicants submit that the combination of Aoki and Fujishima leads to finding a chord from the locations of peaks in the established octave spectrum by pattern comparison with the reference frequency component patterns of the respective chord types; and using the found chord to establish the key by detecting a dominant section in connection with the chord progression and by examining the scale notes of provisional new key and last key in connection with the melody. Applicants submit that neither of these steps are found in the method of the subject invention, and conversely, the step of "determining the key based on a comparison of the respective strengths of the at least second and third notes" is not found in the combination of Aoki and Fujishima.

It appears to Applicants that the Examiner has taken fragments of texts and made them fit on our claim 1, without really looking into the differences in the methods for finding the key. Applicants stress that the Examiner has not explained clearly where the limitation "determining the key based on a comparison of the respective strengths of the at least second and third notes" is found in the prior art. The Examiner refers to col. 7, lines 27-53 of Fujishima. This text portion discusses a peak enhancement processing to obtain prominently exaggerated peaks. Then there is a pattern matching method to calculate the degree of likelihood of being a candidate for the chord of the analyzed sound waveform. This text portion describes a process that takes place before the pattern comparison with the reference frequency component patterns of the respective chord types.

In view of the above, Applicants believe that the subject invention, as claimed is not rendered obvious by the prior art, either individually or collectively, and as such, is patentable thereover.

Applicants believe that this application, containing claims 1-25, is now in condition for allowance and such action is respectfully requested.

Respectfully submitted,

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